



# **North Bay Urgent Wall Improvements PAR**

## **Economic Assessment**

Scarborough Borough Council

23 February 2012

Draft Report

9X1469



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## 1 INTRODUCTION

The purpose of this report is to outline the methodology used for the economic assessment for the North Bay Urgent Wall Improvements Project Appraisal Report (PAR).

The economic assessment for this project builds up on the economic assessment carried out for the 2009 Strategic Appraisal Report (StAR) for the Scarborough Coastal Defence Strategy: Holbeck to Scalby Mills<sup>1</sup>. The details of this strategic economic assessment can be found in Appendix C of the StAR.

The strategic economic assessment was carried out using a probabilistic approach based on seawall failure and landslide scenarios. Damages were assessed from a variety of receptors; property, recreation and amenity, and traffic disruption.

The economic assessment for the PAR takes the strategic assessment probabilistic methodology and updates the input data for the various types of damage receptor based on the most up to date information available. No changes to the assumed probabilities have been made.

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<sup>1</sup> Scarborough Coastal Defence Strategy Review: Holbeck to Scalby Mills, Strategy Appraisal Report. October 2009. Version 3.1.

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## 2 METHODOLOGY

### 2.1 General

Damages have been calculated using the Multi Coloured Manual (MCM) and the Green Book (HM Treasury, 2003). These documents have been used in combination with the Defra FCERM-AG series and Supplementary Guidance Notes. Figures in the Multi Coloured Manual have been updated to 3rd Quarter (December) 2011 using the Consumer Price Index (CPI).

Damages have been calculated for the 100 year appraisal period and discount rates starting at 3.5% and reducing to 2.5% have been applied.

The area at risk has been based on the information presented in the approved StAR. The area highlighted in the Key Plan of the 2009 StAR as being at risk of erosion for the two management units being considered has been taken. This area has been checked against the area of benefits taken for the East Pier, Castle Headland and the Holms Coast Protection Scheme<sup>2</sup> that was completed in 2005 to ensure that double counting of benefits does not occur. The area included within the PAR economic assessment is shown in Appendix A.

### 2.2 Property

#### 2.2.1 Residential

The National Receptor Dataset has been used to identify the number and type of residential properties affected within the at risk area. There are 53 residential properties (including 40 properties in the Sands development) potentially at risk in the North Bay Cliffs Management Unit, and 187 residential properties in the Clarence Gardens Management Unit (MU).

The number of residential properties in the Clarence Gardens MU is less than that included in the Strategy. This is due to the reduced size of the benefit area to ensure that double counting of benefits from the East Pier, Castle Headland and the Holms Coast Protection Scheme does not occur.

Market values for the majority of the residential properties have been assigned to the properties according to type of property using the most up to date data (December 2011) on the Land Registry website for the North Yorkshire region, as shown in Table 1.

**Table 1.** Average house prices for North Yorkshire, December 2011 ([www.landregistry.gov.uk](http://www.landregistry.gov.uk))

Property Type	Average Value
Detached	£265,118
Semi-Detached	£150,630
Terrace	£127,108
Flat	£121,244
ALL	£170,370

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<sup>2</sup> Benefit area of the East Pier, Castle Headland and the Holms coast protection scheme shown in Figure A1 of Scarborough Coast Protection Benefit-Cost Analysis Review Report – January 2003. High Point Rendell. (Document Reference 1586/R003)

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Market values for the residential properties within the Sands development have been derived as an average value from the 92 sales recorded since November 2008 when construction of the development was completed; giving a market value of £230k. More details on the methodology used for the Sands development is given in section 2.2.3.

### 2.2.2 Commercial

The commercial properties within the at risk area have been identified using a combination of data sources:

- The National Receptor Dataset,;
- The properties listed with having business rates on the Valuation Office website ([www.voa.gov.uk](http://www.voa.gov.uk));
- Various online satellite imagery tools; and
- Site visit.

Within the North Bay Cliffs MU there are 75 commercial properties (including 60 holiday let apartments in the Sands development) and 136 beach chalets potentially at risk. In the Clarence Gardens MU there are 61 commercial properties potentially at risk.

Market values for these properties have been derived using the rateable value statistics on the Valuation Office website. Market value is taken as 10 x rateable value of the property updated to December 2011 prices using the CPI.

Where commercial properties have been identified that are not recognised on the Valuation Office website a market value has been assigned from a nearby commercial property of a similar type and size.

### 2.2.3 The Sands

The Sands development was not completed at the time the economic assessment was carried out for the StAR. An allowance was included in the assessment for the development of £20M however.

The Sands development was completed in November 2008 and consists of 100 apartments (mix of one, two and three bedroomed, plus four two-bedroomed penthouse suites), five commercial units including a mini supermarket and cafe, and 136 renovated beach chalets with a new Beach Management Centre.

Of the 100 apartments currently 60 are being used as holiday let properties and the remaining 40 are solely residential premises. The apartments are new build luxury accommodation in a prime location on the seafront. As such the average value for a flat for the North Yorkshire region is likely to underestimate the market value of these properties. A more accurate market value has therefore been established for the Sands development properties.

Based on data available on the internet<sup>3</sup>, which is based on information produced by Land Registry, there have been 92 sales recorded for these apartments since November 2008. The sales prices vary between £140k and £480k. This sales data has been used to provide an average value that can be used as the market value assigned to all of the

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<sup>3</sup> [www.findaproperty.com/house-prices](http://www.findaproperty.com/house-prices)



apartments. Although the market value of the apartments will vary according to size (one, two or three bedrooms) it is not known how many of each size of apartment there are. Therefore an average value has been assigned to all apartments. The average market value is £230k.

Using the standard method for estimating the value of commercial properties using the rateable value results in a value of between £22k and £45k for the holiday let apartments at the Sands, this would give a total value of £1,849k for the 60 units. This is considerably less than the market value the properties would be sold for. As these apartments are identical to the residential apartments and are contained within the same two buildings, and upon resale could easily become residential, it is felt more appropriate to assign the residential value of £230k to the 60 holiday let apartments, this gives a total value of the 60 units of £13,800k.

The 136 beach chalets that were renovated as part of the Sands development are marketed for sale at £36k each. However the value assigned to these units has been derived using the rateable value methodology. The chalets do not appear on the Valuation Office website so the footprint of the chalets has been obtained (2.4m x 2.7m) and the average rateable value for non-bulk premises with floor space for the Yorkshire & Humber region<sup>4</sup> has been applied (£33.06/m<sup>2</sup> uplifted from £30/m<sup>2</sup> in 2008). The value of the chalets included within the economic assessment is therefore £291k (6.48 x 33.06 x 10 x 136).

## **2.3 Recreation & Amenity**

The calculation of the recreation and amenity damages in the StAR economic assessment has been retained and simply updated with more recent information on the number of visitors to the resort of Scarborough. The damages were estimated using two methods; the additional cost of visitors having to travel to an alternative destination (Whitby or Filey), and the reduction in the value of enjoyment (VoE) of visitors using an alternative destination based on figures for VoE presented in the MCM. The damages used in the StAR were the lower bound figure from the two methodologies, which were the additional travel costs (£2.40 per visitor).

The StAR economic assessment used the assumption (based on information from SBC tourism department) that 35% of visitors came to Scarborough because of 'resort factors'. This economic update has assumed there is no change to the figure of 35%. Data presented in the Economic Impact of Tourism Yorkshire 2008<sup>5</sup> shows that the annual number of visitor days to the Scarborough district is 11.684M. For this economic assessment it has been assumed that only 50% of these visitor days are spent in the town of Scarborough. Therefore under the Do Nothing scenario it can be assumed that the 35% of visitors who are motivated by 'resort factors' would no longer visit Scarborough, this results in the total number of visitors affected of 2.045M

The total damage across the full strategy frontage would therefore be £4,908k a year. The damages were distributed uniformly across the 12 management units (MU) in the StAR as no information was available on the breakdown of visitors to different sections of the frontage and those visiting would generally need to travel through several of the

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<sup>4</sup> <http://www.communities.gov.uk/publications/corporate/statistics/floorspace2008>

<sup>5</sup> Welcome to Yorkshire Economic Impact of Tourism Yorkshire 2008



MUs in order to reach the MU of their choice. This approach has been replicated in the economic assessment for the PAR, giving an annual damage per MU of £409k.

Under the Do Nothing scenario the annual recreation and amenity damages would apply each year of the appraisal period after a major failure has occurred on that frontage. Therefore the damages for each of the MU being considered in the PAR discounted over 100 years are £12,193k.

## **2.4 Traffic Disruption**

The traffic disruption damages come from the loss of Royal Albert Drive (immediately behind the seawalls) should the seawall fail. This is part of the major route around the headland from North Bay to South Bay; this route includes Marine Drive which was protected by the East Pier, Castle Headland and the Holms Coast Protection Scheme, completed in 2005.

As part of the justification for the East Pier, Castle Headland and the Holms Coast Protection Scheme the traffic disruption damages for the entire route around the North Bay frontage were calculated over 100 years as £19,134k<sup>6</sup>. The Strategy identified that 29% of the road traffic damages could be attributed to Royal Albert Drive.

For the PAR economic assessment the road traffic damages have been uplifted using CPI to a December 2011 base date and the 29% applied.

## **2.5 Services**

Yorkshire Water is investing in the region of £110million along the north-east coast in advance of the Revised Bathing Water Directive which comes into effect in 2015, with a significant proportion in the Scarborough area (greater than £50M). Part of the investment in their infrastructure is in the vicinity of the scheme proposed by this PAR, and some of their assets are protected by the coast defence structures. Therefore should the coastal defence assets fail then the Yorkshire Water services would be at risk of erosion, this would have a major impact as they are part of the critical infrastructure for the town, and may also result in pollution in the North Bay.

It has been assumed that the value of the Yorkshire Water assets being protected by the seawalls is £5M.

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<sup>6</sup> East Pier, Castle Headland and the Holms Engineers Report 2001



**3**

**DAMAGE ASSESSMENT RESULTS**

The results of the damage assessment for the North Bay Cliffs and Clarence Gardens management units are shown in Table 2 for the cash values of the different damage receptors. These values have then been used to update the inputs into the spreadsheets from the Strategy for the probabilistic determination of the Present Value Damages. The present value damages for the PAR economic assessment are shown in Table 3, and for the StAR in Table 4 for comparison.

**Table 2.** Cash damage values for damage receptors

Damage Receptor	North Bay Cliffs Management Unit	Clarence Gardens Management Unit
Residential Property	£10,961k	£23,239k
Commercial Property	£17,347k	£4,735k
Recreation & Amenity	£12,193k	£12,193k
Traffic Disruption	-	£20,874k
Services	-	£5,000k
<b>TOTAL</b>	<b>£40,501k</b>	<b>£66,041k</b>

**Table 3.** Present Value Benefits of Preferred Strategic Option for the updated PAR economic assessment

Option	North Bay Cliffs Management Unit	Clarence Gardens Management Unit
Do Nothing PV Damages	£34,935k	£46,483k
Preferred Strategic Option (Option 3) PV Damages	£1,067k	£1,722k
Preferred Strategic Option (Option 3) PV Benefits	£33,868k	£44,661k
	<b>£78,529k</b>	

**Table 4.** Present Value Benefits of Preferred Strategic Option included in the StAR economic assessment

Option	North Bay Cliffs Management Unit	Clarence Gardens Management Unit
Do Nothing PV Damages	£22,461k	£52,135k
Preferred Strategic Option (Option 3) PV Damages	£2,286k	£3,884k
Preferred Strategic Option (Option 3) PV Benefits	£20,174k	£48,250k
	<b>£68,424k</b>	



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## COST-EFFECTIVE ASSESSMENT

A cost-effective assessment (CEA) has been carried out for this Sustain Standard of Service scheme in accordance with the Flood and Coastal Erosion Risk Management Appraisal Guidance. A summary of the results are shown in Table 5.

The baseline for a CEA is the Do Minimum, defined as the minimum action or intervention needed to ensure that the legal requirements or performance of an asset is met. Option 1 Phased Repair Scheme is the minimum amount of intervention that can be carried out whilst maintaining the current standard of service of the asset system in North Bay. Therefore Option 1 is the baseline for this CEA.

**Table 5.** Summary of Cost-Effective Analysis

Option		PV Benefits	PV Costs	Incremental PV Cost	BCR
1	Phased Repair Scheme	£78,529k	£13,846k	-	5.67
2	Full Repair Scheme	£78,529k	£14,347k	£501k	5.47
3	Capital Scheme	£78,529k	£26,352k	£11,733k	2.98

From Table 5 it can be seen that Option 1 Phased Repair Scheme has the highest benefit-cost ratio. The incremental PV cost to the next option is significant at £773k but there are no significant additional benefits from Option 2. Although Option 3 offers the additional benefits of reducing the wave overtopping sooner and requires less interventions and therefore disruption, the incremental PV cost is very high at £11,733k and is therefore not justified.

Option 1 Phased Repair Scheme is therefore the economically preferred option.



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## FDGiA CALCULATOR

As the scheme proposed in the North Bay Walls Urgent Improvements PAR does not cover the full length of the frontage in the two management units the benefits have been factored according to the proportion of the frontage being included in the scheme. The scheme will carry out improvement works to 76% of the Clarence Gardens frontage and 2% of the North Bay Cliffs frontage. Therefore the PV benefits and number of properties protected by the scheme have been factored accordingly, resulting in a revised PV benefit of **£34,620k**.

The study area is covered by three Lower Super Output Areas (LSOA), these have different scores on the Index of Multiple Deprivation which cover all three bands used within the FDGiA Partnership Funding calculator, as shown in Table 6.

**Table 6.** Index of Multiple Deprivation (IMD) for Study Area

LSOA Code	LSOA Name	IMD Rank	IMD Score	No. Residential Properties (Households)	
				North Bay Cliffs MU (2% of frontage)	Clarence Gardens MU (76% of frontage)
E01027846	Scarborough 006C	6794	20.92%	40 (0)	19 (14)
E01027847	Scarborough 006D	885	2.75%	0	168 (128)
E01027848	Scarborough 006E	20402	63.81%	13 (0)	0

Note: numbers in brackets show number of households included within the FDGiA Partnership Funding calculations factored according to proportion of frontage included within scheme.

The whole life costs have also been factored, with all future costs (capital scheme, ongoing routine maintenance of asset system, and strategic costs) factored according to proportion of frontage included within the scheme. The initial costs for the repair works within the PAR have not been factored as these just cover the sections of frontage within the scheme. This gives a revised PV whole life cost of £7,169k.

A summary of the FDGiA Partnership Funding calculator is shown in Table 7 and the output from the spreadsheet is included in Appendix C.

**Table 7.** Summary of Outcome Measures and FDGiA Partnership Funding Calculator

Outcome Measures		Number	Qualifying Benefits	FDGiA Contribution
OM1 (Economic Benefit)			£26,294k	£1,461k
OM2 (Households better protected against flooding)	20% most deprived areas	0	£0	£0
	21-40% most deprived areas	0	£0	£0
	60% least deprived areas	0	£0	£0
OM3 (Households better protected against coastal erosion)	20% most deprived areas	128	£7,466k	£3,360k
	21-40% most deprived areas	14	£844k	£253k
	60% least deprived areas	0.25	£15k	£3k
OM4 (Statutory Environmental Obligations Met)			£0	£0
TOTAL FDGiA Contribution				<b>£5,077k</b>
Raw OM Score				70.82%
Cost saving and/or external contribution required				£184k
Scheme Contributions Secured				£184k
Adjusted OM Score				100.12%
FDGiA required for next phase				<b>£446k</b>

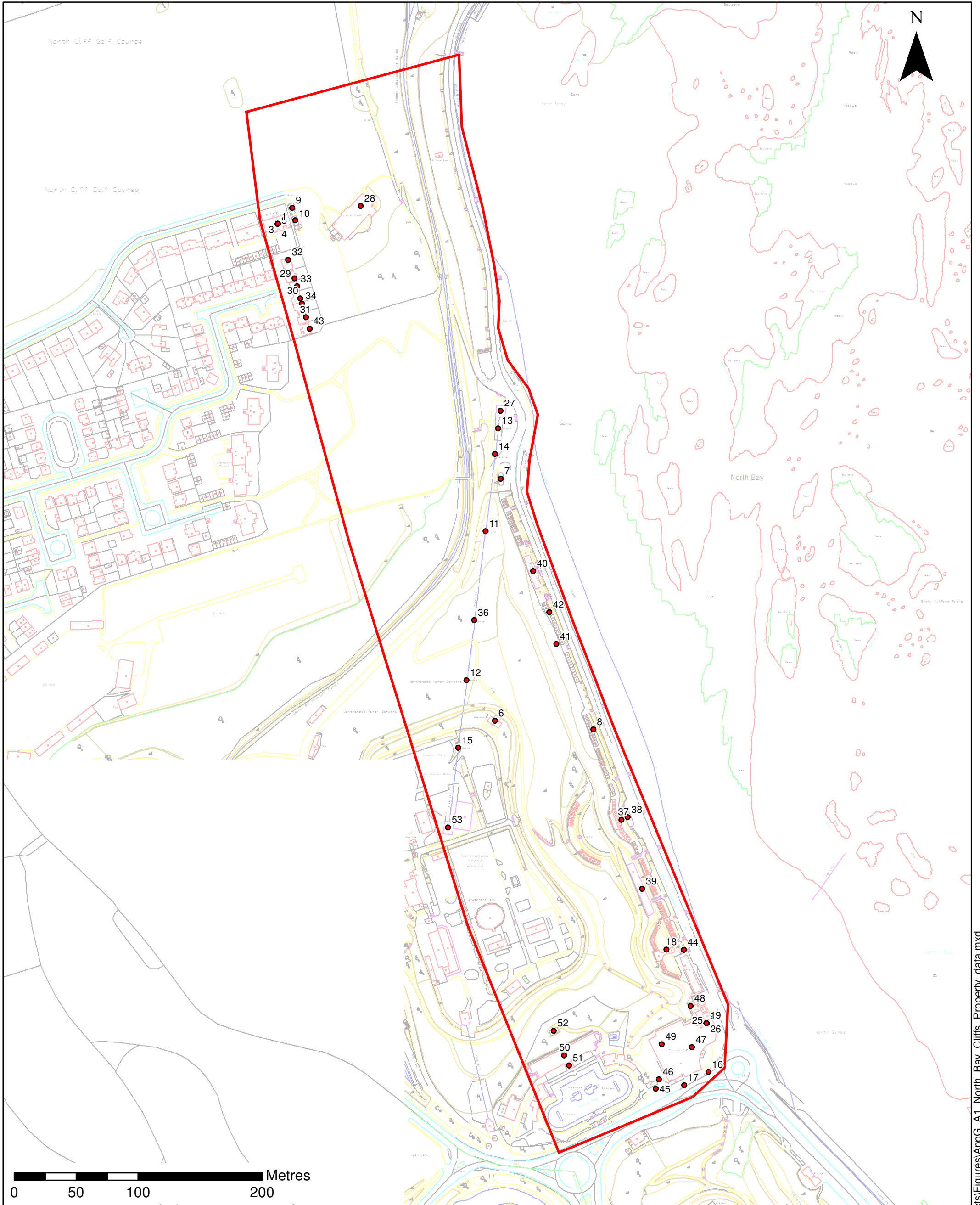


## Appendix A

### Figures







Key:

Benefit Area

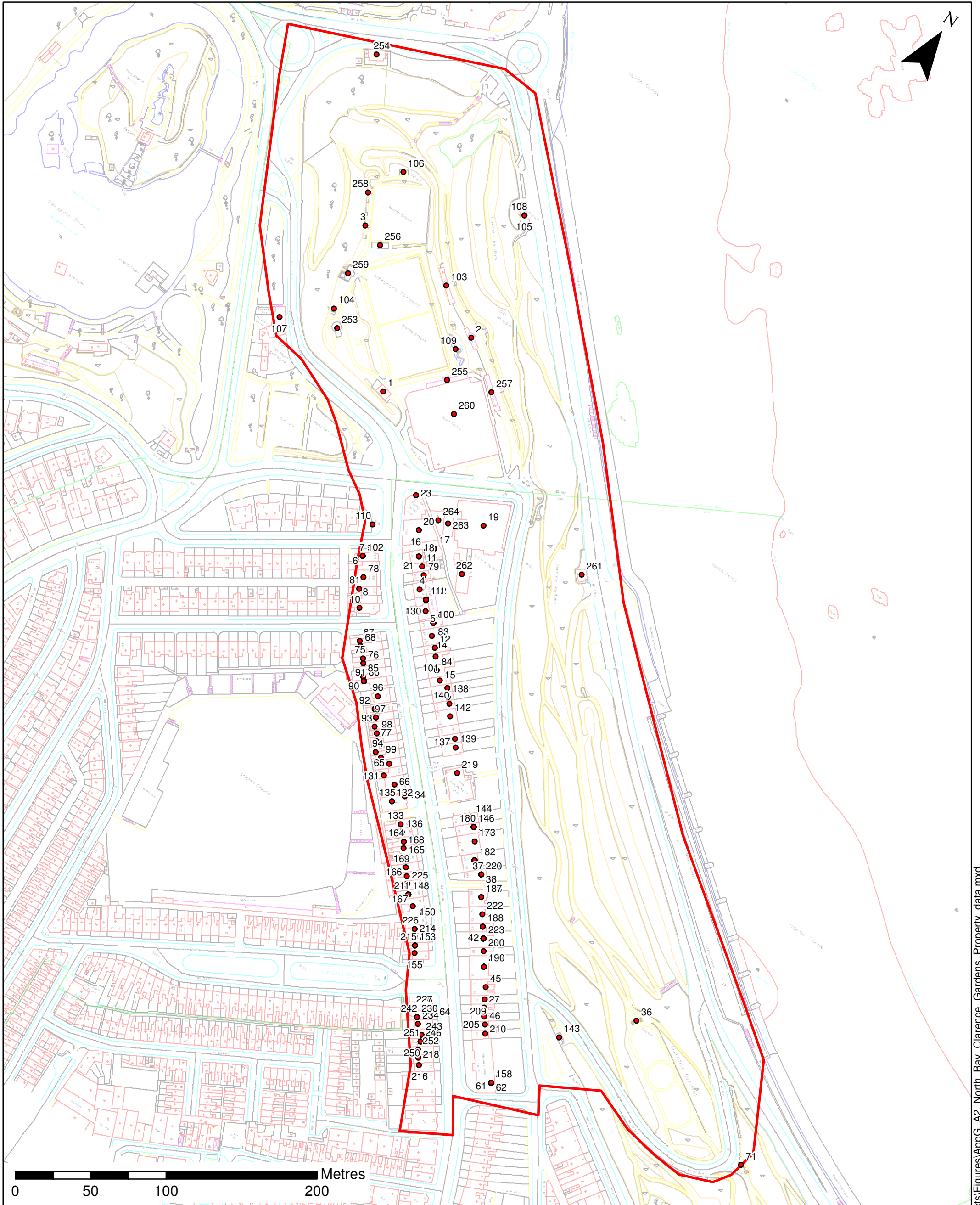
Title:  
Benefit Area: Cliffs

Project:  
North Bay PAR - Cliffs


Client:  
Scarborough Borough Council

Date: March 2012		Scale at A3: 1:2,800
Figure: A1	Drawn: TC	Checked: EH





Key:

 Benefit Area

Title:  
Benefit Area:  
Clarence Gardens

Project:  
North Bay PAR -  
Clarence Gardens

Client:  
Scarborough Borough Council

Date: March 2012		Scale at A3: 1:2,300
Figure: A2	Drawn: TC	Checked: EH





Appendix B  
Damages Spreadsheets



Project Summary Sheet					
<b>Client/Authority</b>			Prepared (date)		
Scarborough BC			19/02/2008		
<b>Unit name</b>			Printed		
North Bay Cliffs			10/05/2012		
<b>Project reference</b>			Prepared by		
Base date for estimates (year 0)			PLM		
Scaling factor (e.g. £m, £k, £)			Checked by		
Principle land use band			APP		
Initial discount rate			Checked date		
Optimism bias factor			16.3.08		
<b>Costs and benefits of options</b>					
<b>Costs and benefits £k</b>					
	No Project	Option 2	Option 3	Option 4	
<b>PV costs from estimates</b>	0.00	2,379.17	3,542.88	6,296.69	
<b>Optimism bias adjustment</b>		1,427.50	2,125.73	3,778.01	
<b>Total PV Costs for appraisal PVc</b>		2,713.00	5,668.61	10,074.71	
<b>PV damage PVd</b>	34,934.83	2,506.44	1,067.20	1,067.20	
<b>PV damage avoided</b>		32,428.39	33,867.62	33,867.62	
<b>PV assets Pva</b>					
<b>PV asset protection benefits</b>		0.00	0.00	0.00	
<b>Total PV benefits PVb</b>		32,428.39	33,867.62	33,867.62	
<b>Net Present Value NPV</b>		29,715.39	28,199.02	23,792.92	
<b>Average benefit/cost ratio</b>		11.95	5.97	3.36	
<b>Incremental benefit/cost ratio</b>			0.49	0.20	
Highest b/c - -					
<b>Brief description of options:</b>					
Option 1	Do Nothing/ No Active Intervention				
Option 2	Minimal Intervention				
Option 3	Seawall repairs & slope stabilisation				
Option 4	Seawall repairs, slope stabilisation & beach recharge				

Project Summary Sheet					
<b>Client/Authority</b>			Prepared (date)		
Scarborough BC			19/02/2008		
<b>Unit name</b>			Printed		
Clarence Gardens North			10/05/2012		
<b>Project reference</b>			Prepared by		
			PLM		
Base date for estimates (year 0)			Checked by		
Dec-2007			APP		
Scaling factor (e.g. £m, £k, £)			Checked date		
£k (used for all costs, losses and benefits)			15.3.08		
Principle land use band			(A to E)		
A					
Initial discount rate			3.5%		
Optimism bias factor			60.0%		
<b>Costs and benefits of options</b>					
<b>Costs and benefits £k</b>					
	No Project	Option 2	Option 3	Option 4	
<b>PV costs from estimates</b>	0	2,749	11,660	14,252	
<b>Optimism bias adjustment</b>		1,650	6,996	8,551	
<b>Total PV Costs for appraisal PVc</b>		4,399	18,656	22,804	
<b>PV damage PVd</b>	46,383	10,543	1,722	1,722	
<b>PV damage avoided</b>		35,840	44,661	44,661	
<b>PV assets Pva</b>					
<b>PV asset protection benefits</b>		0	0	0	
<b>Total PV benefits PVb</b>		35,840	44,661	44,661	
<b>Net Present Value NPV</b>		31,441	26,005	21,858	
<b>Average benefit/cost ratio</b>		8.15	2.39	1.96	
<b>Incremental benefit/cost ratio</b>			0.62	0.48	
Highest b/c - -					
<b>Brief description of options:</b>					
Option 1	Do Nothing/ No Active Intervention				
Option 2	Minimal Intervention				
Option 3	Rock revetment, seawall repairs & slope stabilisation				
Option 4	Rock revetment, seawall repairs, beach recharge & slope stabilisation				



## Appendix C

### FDGiA Calculator







# FDGiA Calculator, based on interim funding arrangements announced 23rd May 2011

ePublications Catalogue Product Code - FLHO0511BTXS-E-E

Project Name/ref: North Bay Urgent Wall Improvement PAR

Key	Input cells
	Calculated cells

## Summary: prospect of FDGiA funding

"FDGiA Contribution":	£ 5,076,844	
"Raw OM Score":	70.82%	
Cost saving and/or external contribution required	£ 184,260	Scheme Benefit to Cost Ratio: 4.83 to 1
Less scheme contributions secured:	£ 185,000	Effective return to taxpayer: 6.82 to 1
"Adjusted OM Score":	100.12%	Effective return to area: 187.13 to 1
Result:	Potential candidate for FDGiA funding dependant upon funding availability	
FDGiA required for next phase(s):	£ 446,386	

## 1. Scheme details

Who will maintain asset?	LA
PV Whole-Life Costs:	£ 7.1690 million
PV Whole-Life Benefits:	£ 34.6195 million
Cash cost of next phase(s):	£ 0.63139 million
Duration of Benefits:	30 years
Average flood damages:	£ 30,000 per household
Construction phase?	Yes - costs for approval include construction

## 2. Qualifying benefits under Outcome Measure 2: households better protected against flood risk

Number of households in:	Before	After	Change due to scheme
20% most deprived areas			0 0 0
21-40% most deprived areas			0 0 0
60% least deprived areas			0 0 0
At: Moderate risk	Significant risk	Very significant risk	Moderate risk
			Significant risk
			Very significant risk
Annual damages avoided, compared with a household at low risk			
	£ 150	£ 600	£ 1,350

Change in household damages, in:	Per year	Over lifetime of scheme	Qual. benefits (discounted)
20% most deprived areas	£ -	£ -	OM2 (20%) £ -
21-40% most deprived areas	£ -	£ -	OM2 (21-40%) £ -
60% least deprived areas	£ -	£ -	OM2 (60%) £ -

## 3. Qualifying benefits under Outcome Measure 3: households better protected against coastal erosion

Number of households in:	Before	Damages per household avoided:
20% most deprived areas	- 128	Annual damages avoided £ 6,000 £ 6,000
21-40% most deprived areas	- 14	Loss expected in £ 50 £ 20 years
60% least deprived areas	- 0	Present value of Year 1 loss (i.e. first year damages, discounted based on when loss is expected) £ 1,184 £ 3,015
	Long-term loss	Medium-term loss

Change in household damages, in:	Year 1 loss avoided:	Over lifetime of scheme:	Qual. benefits (discounted):
20% most deprived areas	-£ 385,006	-£ 11,550,170	OM3 (20%) £ 7,466,047
21-40% most deprived areas	-£ 43,542	-£ 1,306,269	OM3 (21-40%) £ 844,374
60% least deprived areas	-£ 784	-£ 23,520	OM3 (60%) £ 15,203

## 4. Qualifying benefits under Outcome Measure 4: statutory environmental obligations met

Payments under:	Assumed benefits per unit:	Qual. benefits (discounted):
OM4a Hectares of net water-dependent habitat created	£ 15,000	OM4a £ -
OM4b Hectares of net intertidal habitat created	£ 50,000	OM4b £ -
OM4c Kilometres of protected river improved	£ 80,000	OM4c £ -
		OM4 £ -

## 5. Qualifying benefits arising from the overall scheme, for entry into the Medium-Term Plan

OM, deprivation:	Qual. benefits:	Payment rate:	FDGiA contribution:
OM1	£ 26,293,854	5.56 p in the £1	£ 1,460,770
OM2	20% most £ -	45.0	£ -
	21-40% £ -	30.0	£ -
	Least 60% £ -	20.0	£ -
OM3	20% most £ 7,466,047	45.0	£ 3,359,721
	21-40% £ 844,374	30.0	£ 253,312
	Least 60% £ 15,203	20.0	£ 3,041
OM4	£ -	100.0	£ -
Total	£ 34,619,480		£ 5,076,844

The "FDGiA Contribution" towards the scheme's whole-life benefits

**Sensitivity Testing.** It is important that users of this calculator appreciate the implications on funding from changes to input data which may become necessary as the project develops and better information is available. Three typical tests are provided below. Users should consider how appropriate these are their project, what other tests may be appropriate and how best to use the information with all those that may be involved in the project.

Revised:	FDGiA Contribution	Raw OM Score
1. Change in PV Whole Life Cost (30% increase)	£ 5,076,844	54.47%
2. Change in OM2 - 50% of households in Very Significant (Before) risk may already be in Significant Risk band	£ 5,076,844	70.82%
3. Change in OM3 - 50% of households in Medium Term loss (Before) may already be in Long Term loss	£ 4,118,974	57.46%